

TURBINE MOTOR FOR PNEUMATIC TOOLS

FIELD OF THE INVENTION

5 The present invention relates to a turbine motor
for a pneumatic tool, particularly to a turbine motor
which transforms pneumatic energy of air at high
pressure into rotational energy, combining high power
output of pneumatic tools and high efficiency with
10 simple structure and compact design.

DESCRIPTION OF RELATED ART

15 Pneumatic tools like air levers generally are
driven by turbines that transform pneumatic energy of
air at high pressure into rotational energy.

 A turbine motor for an air lever with a regulating
device, as shown in Fig. 6, has been disclosed in
Taiwan patent no. 482075, mainly comprising a pneumatic
20 tool main body a and an adjusting rod b. The pneumatic
tool main body a further comprises: a tool case c; an
air inlet controlling device d; a rotor e; and a motor
body f. A chamber g lies inside the pneumatic tool main
body a, with inlet and outlet tubes leading into the
25 chamber g. The motor body f is fixed inside the chamber
g. Compressed air is led into the chamber g, driving a
rotational movement of the rotor e in the motor body f.
A rotating head h is set on the rotor e and is used as
a rotating tool. The motor body f has a valve i, which
30 is an integral hollow body, and is placed in the

chamber g. The valve i has forward and reverse flow grooves and on a lower side an inlet hole j. The adjusting rod b passes through the valve i.

Longitudinal shifting of the adjusting rod b controls
5 flow of air into the valve i by causing air to enter different forward and reverse flow grooves, allowing to control directions of the rotational movement of the rotating head h.

Referring to Fig. 7, U.S. publication no.
10 2003/0121680 has disclosed a turbine motor for an air lever with a regulating device, as taught in Taiwan patent no. 482075 cited above. In Fig. 7, the turbine motor is placed within the dash-dotted circle. Both publications describe similar turbine motors for use in
15 pneumatic tools.

A conventional turbine motor for pneumatic tools, as described above, has an arrangement of the rotor and the flow grooves that makes it complicated to regulate airflow. Furthermore, air of high pressure entering the
20 rotor from a perpendicular direction hits rotor blades at a certain angle, causing high material stress and reduced efficiency, therefore not allowing for operation under high load and at high speed.

Considering the shortcomings of conventional art,
25 the present inventor has designed a turbine motor which, following physical laws of conservation of angular momentum and gas dynamics, offers higher effectivity, better efficiency and a simplified passage of air.

SUMMARY OF THE INVENTION

It is the object of the present invention to provide a turbine motor for a pneumatic tool having a rotor hit by air in a radial direction, thus achieving high effectivity, good efficiency and a compact design.

The present invention can be more fully understood by reference to the following description and accompanying drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Fig. 1, the turbine motor for a pneumatic tool of the present invention comprises: a casing 10; a rotor 20; and an axis 30, on which the rotor 20 is set. The casing 10 is a hollow body surrounding a chamber 11 and having a hole accommodating the axis 30. An air inlet 12 and an air outlet 13 are attached to the casing 10. The rotor 20 is placed in the chamber 11, having an axis body and a plurality of rotor blades 21. Compressed air entering the chamber 11 through the air inlet 12 drives a rotational movement of the rotor 20. The axis 30 has a rear end borne by the casing 10 and a front end passing through the hole of the casing 10, providing torque.

Operation of the turbine motor for a pneumatic tool of the present invention is as follows: Compressed air enters the chamber 11 through the inlet 12, flows towards the axis body of the axis 20 and hits the rotor blades 21, exerting torque on the axis 30. Since the

direction of air flow leaves the rotor blades 21 of the rotor 20 exposed longer and more effective as compared to conventional art, higher output power and better efficiency are attained, making the present invention
5 suitable for high speed and high load.

Referring to Fig. 2, for more effective driving of the rotor 20, a stator 40 is inserted between the rotor 20 and an inner wall of the casing 10. The stator 40 has a plurality of stator blades 41 which surround the
10 rotor blades 21 of the rotor 20 and are radially oriented, being placed opposite the inlet 12. Compressed air entering the chamber 11 through the inlet 12 is deflected by the stator 40 to hit the rotor blades 21 uniformly, increasing efficiency.

Referring to Fig. 3, for regulating forward and reverse directions of the rotating movement, two orientations of the stator blades 41 are adjustable. The stator 40 has a ring body with a plurality of blade supports 42. The stator blades 41 are turnable on the
20 blade supports 42, allowing to control in which directions the rotor blades 21 are hit by compressed air, in particular, to regulate forward and reverse directions of the rotating movement. Thus a greatly simplified structure, as compared to conventional art,
25 is achieved.

Referring to Fig. 4, for even higher power output of the rotor 20, an air whirling device 70 is placed around the stator 40, reducing turbulence. A shield 60 and an outlet passageway 61 placed in the chamber 11
30 along airflow to the stator 40 contribute to minimizing

power loss.

Furthermore, a multiple bearing 50 carries the axis 30, so that the axis 30 and the rotor 20 are disposed within the shield 60, without friction between the axis 30 and the shield 60 being generated, so that no power is wasted.

As shown in Figs. 5A and 5B, the present invention in another embodiment has a rear casing 80 substituted for the shield 60 and the stator 40, tightly surrounding the rotor 20 and the rotor blades 21. A valve 90 allows to switch incoming airflow on and off. An air direction adjusting knob 91, moving either axially or in an angular direction and directing compressed air from the inlet 12, allows to control forward and reverse directions of the rotational movement of the rotor 20.

As above explanation shows, the present invention, as compared to conventional art, has the following effects:

1. By guiding incoming compressed air onto the rotor blades in directions of rotation and having air hit the rotor blades at high speed, the rotor blades are exposed to compressed air for long time intervals and to a large part. In conventional art, rotor blades are hit by compressed air in a perpendicular direction, being exposed shorter times and to a minor part, so that a lower power output and lower speed than in the present invention are achieved.
2. By employing a stator with a variable angular

position, the present invention allows to vary the direction of airflow, controlling forward and reverse directions of the rotational movement within a simple structure.

5 Conventional art requires a penetrating, complicated structural part for controlling forward and reverse directions of the rotational movement.

10 3. The present invention has an air whirling device, directing compressed air to hit all of the rotor blades simultaneously, greatly increasing effectivity. Conventional art allows compressed air only to hit one rotor blade in a given time unit, obviously resulting in lower
15 effectivity than the present invention.

4. Higher output power and greater effectivity make the present invention suitable for high speed and high load.

20 While the invention has been described with reference to preferred embodiments thereof, it is to be understood that modifications or variations may be easily made without departing from the spirit of this invention which is defined by the appended claims.

25 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional side view of the turbine motor for a pneumatic tool of the present invention.

30 Fig. 2 is a sectional side view of the turbine motor for a pneumatic tool of the present invention in

an embodiment with a stator.

Fig. 3 is a sectional front view of the stator of the present invention.

5 Fig. 4 is a sectional side view of the turbine motor for a pneumatic tool of the present invention in an embodiment with an air whirling device, a shield and an outlet passageway.

10 Fig. 5A and 5B are sectional views of the turbine motor for a pneumatic tool of the present invention in another embodiment.

Fig. 6 (prior art) is a perspective view of a conventional turbine motor for a pneumatic tool.

15 Fig. 7 (prior art) is a sectional side view of a conventional turbine motor for a pneumatic tool.